

28. The method of claim 1 wherein in said constructing step, the tailored filter elements include variable controls.

29. The method of claim 5 wherein in said constructing step, the tailored filter elements include variable controls.

30. The system of claim 13 wherein in said constructing step, the tailored filter elements include variable controls.

REMARKS

Claims 1-5 and 13-15 remain in the application. Claims 1-5, 13, and 14 have been amended.

Claims 28-30 have been added.

Rejections Under 35 U.S.C. §§ 103 (a)

Claims 1-5 were rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent No. 5,765,134 to Kehoe ("Kehoe"). Claims 1-5 and 13-15 were rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent No. 4,311,872 to Davis ("Davis"). These rejections are traversed, in part, because the cited references fail to teach or suggest a microphone-tailored equalizing system and method as recited in the pending claims.

Claims 1-5 and Kehoe

Claim 1 refers to a comparison between sounds from an acoustic sound generating source (e.g., a guitar). The claims have been amended to refer to an ‘acoustical generator’ rather than ‘acoustic instrument’ to further bring out the presence of an original acoustical generator that generates an acoustic signal.

In the present invention, the reference sounds of step 4 are used as a fixed point of comparison, as described in the comparison step (5) of claim 1:

“(5) comparing the sounds of the acoustical generator as picked up by the first microphone with the reference sounds as generated by the acoustical generator....”

The comparison is made between sounds of the acoustical generator as picked up by a first microphone and reference sounds of the acoustical generator. “Reference sounds” is a term defined in the specification (see, e.g., Pages 8-9). Note that a key feature of Kehoe is to involve a feedback loop that includes, and specifically intends to induce changes to, the output of the sound generator.

In the present invention, once these sounds are compared, a tailor-made equalizer can be created to compensate for differences between the two. In one embodiment, if the reference sounds are detected at an “optimum” location, the output of the first microphone (with the tailor-made equalizer) will be similar to the reference sounds (i.e., will sound as if the acoustical generator’s signal was being detected at an optimum location by an optimum detector). In claim 5, this feature of the present invention is taken a step further in that several acoustical generators of a given type are used so as to create a tailor-made equalizer that could work with the first microphone on other acoustical generators of the same type and may have a negligible amount of adjustment and require no expertise.

The purpose and method of Kehoe is to start with an original acoustic signal (a person's voice), output a signal that sounds purposely different, and use this output signal to purposely force the person to alter his/her voice. The embodiments and techniques described in Kehoe are quite different from the presently claimed invention. Significantly, Kehoe does not teach and/or suggest each of the elements of independent claims 1 and 5. Fundamental to Kehoe's method is a feedback loop from the device output to the ear of the human speaker (the acoustical generator) in a manner whose goal is to alter the output of the human speaker. Once the human speaker is listening to his/her voice in the headphones as modified by the Kehoe system, the human speaker then changes his/her voice so that his/her voice sounds more like he/she desires. Thus, there is no comparison in Kehoe between a reference sound and some other sound. To the extent that the human speaker's voice is considered the reference sound, it is clear from Kehoe that no comparison is made to that sound. Moreover, the human speaker is expected to modify this sound so that the result of the Kehoe system is attained. Additionally, since the output of the Kehoe system is a purposely distorted signal that is only heard by the talker as an internal element of the system and which is not compared to sounds from any acoustical generator, this also cannot be considered a reference sound as recited in the claims.

In the last paragraph of page 2, the Office Action in describing Kehoe, states
“...The principle of the invention is to change the voice signal from that which is picked-up by the microphone into the ‘ideal’ signal to be heard by the user...”

Applicant respectfully disagrees. The principle of the Kehoe invention is to change the signal as transmitted by the microphone into something extremely distorted and changed from its original acoustic sound source, in an attempt to then alter the original voice signal by using the

newly distorted sound in a biological feedback loop to the ears of the human speaker with the original voice signal. What the user hears is not an 'ideal' signal, but an extremely modified signal that is supposed to make the user's voice change in quality because of what the user is hearing. A common example of how this works is as when a person is wearing headphones, and then shouts when talking to someone nearby. The headphones make it hard for the person to hear themselves, and the result is shouting by the headphone wearer (without knowing it), in an attempt to sound 'normal' to themselves. Kehoe is seeking to exploit this effect.

The current Office Action states in the last sentence of page 2:

"...Therefore, the general teaching of having a specific equalizer designed to compensate for the actual signal received by a microphone and the reference sound of the sound producer was known..."

– also from the Office Action (towards the bottom of page 3):

"...change the settings of the equalizer to compensate for the differences between the voice signal heard and the voice signal desired..."

Applicant contends that these features are not discussed or even intimated in Kehoe. This quote is from Kehoe Col. 5, lines 25-30:

"These effects use several other digital effects:
Equalization, which can attenuate or boost low, middle, high frequencies.
Distortion.
Dynamic range compression makes the voice sound flatter.
The "robot" voice is created with a ring modulator, a delay, and reverb. ..."

This is the ONLY USE of any word containing the words 'EQ', 'EQUAL', OR 'EQUALIZER' anywhere in the Kehoe reference, and it only functions as part of a glossary-like section which is a list of the signal processor functions included in the specific Zoom 9002

commercial device described therein. As can be seen in this quote, there is nothing but the most basic dictionary-like description of the word 'equalizer'. There is not a single reference or discussion involving the use of any equalizer, whether in the Zoom 9002 device or elsewhere. There is also not even one equalizer setting given in his detailed and seemingly complete descriptions of the twenty settings for his processor (Cols. 10-11). Thus, there is not any discussion of any method of, or purpose for, adjusting any equalizer or filter to do anything at all that relates to "... compensate for the actual signal received by a microphone and the reference sound of the sound producer..." as stated in the office action.

– From the Office Action (page 3, line 3):

"...the reference sounds are that of a confident person, happy person, deep voiced person, etc..."

The Office Action's intimated reference sounds do not in physicality exist AT ALL until AFTER the entire process of the Kehoe invention, and therefore can in no logical way be construed to be the reference to which signals are compared as recited in the claims.

– From the Office Action (8 lines from bottom, pg 3):

"...change the settings of the equalizer to compensate for the differences between the voice signal heard and the voice signal desired..."

The signal resulting from Kehoe's system (output of Fig.1, Effects processor 5) is directed ONLY to the human speaker, via Earphones 6 of Fig.1, so that any changes from processor 5 are made only to the sound of the 'feedback signal' to the human speaker, and do not do anything to the signal which is supposed to be "...the voice signal desired...". In order to "...change the settings of the equalizer to compensate for the differences between the voice signal

heard and the voice signal desired...”, an equalizer would have to be introduced somewhere between the output of Fig.1 Pre-Amplifier 2 and the input of Fig.1 Telephone 9. Such an equalizer is nowhere described, intimated, or necessary.

It is noted that elements 7,8,9,10 and 11 of Fig.1 are only for use in adapting the system of Kehoe for use with a telephone. In the Detailed Description’s ‘Operation of invention’ section (Col.5 line 66 through Col.6 line 49), there is no telephone and no PA system mentioned, and the Kehoe system is operating in a circumstance where the human speaker is communicating directly to her audience only with the acoustic energy generated by her speaking directly into the air. In this case, elements 7,8,9,10 and 11 of Fig.1 do not exist, and there is no possible signal path for any processor or equalizer to be used to compensate for anything.

- From the Office Action (Page 3, line 8):

"...the processor 5 of Kehoe is programmed for each specific speaker..."

Applicant respectfully disagrees. The processor is programmed for different effect combinations (e.g. "Deep Voice", "Semi-Happy", "Alien") as described in columns 9 through 11. Methods for adjusting these pre-set effect combinations are not discussed or alluded to. Since these settings are static, it cannot be said that it has been programmed for each specific human speaker.

Claims 1-5 and 13-15 and Davis

In addition to claim 1, independent claims 5 and 13 refer to a comparison of sounds from a first microphone placed proximate to an acoustic generator and reference sounds as generated

from the acoustic generator. Davis fails to teach or suggest these features of the claims. In the system of Davis, there is no discussion of a reference, and no attempt is made to compare any sound with any reference. There is only a goal in Davis to make the spoken voice more intelligible, which is not specifically defined. There are discussions of some specific problems and solutions for them, particularly the way the human speaker's voice is distorted by being enclosed in a mask, but the end goal is described only as 'intelligible'.

"Intelligibility" is derived from specific aspects of human speech, and these aspects are INDEPENDENT of the source, so solutions for increasing intelligibility do NOT depend on the source 'signal' (e.g., the human speaker), which makes the analogy to the 'reference' of the presently claimed invention inaccurate. Processing a voice to be more 'intelligible' is relatively easy, because the adjustments are made to accommodate what the listener wants to hear, regardless of what it sounded like to begin with.

- From the Office Action, Page 4, line 8:

"...the general teaching that a picked-up voice signal can be equalized to sound more like a reference sound (the speaker's actual voice) using an equalizer was well known in the art..."

Equalizing to a reference is discussed in the specification of the present invention, for example at the bottom of page 20:

"...In the simplest performance of the comparison step, the sound signal delivered by the first microphone to either a monitor loudspeaker or an earphone can be compared directly and simultaneously with the sound received acoustically by an audio engineer stationed at an equalizer located at the listening site. During repeated playings of a specific note or chord, the

engineer adjusts the equalizer to bring the sound from the first microphone into coincidence with the reference sound heard directly...”

Davis does not teach to choose a specific reference, the comparison of that reference with the output of a first microphone, or the construction of a tailor-made equalizer to compensate for differences between the two. Such a tailor-made equalizer may combine a specific reference with a specific transduction system and placement, and to then design and construct a processing system for use under those circumstances in a manner that may simplify the process by eliminating elements, ranges, and combinations of elements and ranges that are for the defined circumstance ineffective, undesirable, or confusing. Davis never addresses the issue of a set of frequency bands required to accommodate a signal from a specific acoustic generator or generator type.

From the Office Action, Page 4, 5 lines from the bottom:

–“...the equalizer 34 of Davis was programmed with specific electrical components to make the picked-up voice sound more like the actual voice of the user...”.

The terms “Equalizer”, EQ, etc. do not appear in the cited reference. The only use of the word “filter” in the entire document is in the abstract, Col. 5 line 37, and claims 2 and 9. These all contain the same sentence:

(Abstract): “...feedback network that acts as a low pass filter and corrects the phase shift of the different lower frequency audio signal components while emphasizing the higher frequency components...”

Claim 2: “... the amplifier with the frequency variable phase shift network consists of a negative feedback network that operates as a low pass filter to selectively increase the

amplification of higher frequency audio signals while decreasing the amplification of lower frequencies...”

Claim 9: “...said inductive element and said capacitive network are coupled in series as a low pass filter with a variable Q to selectively vary the phase shift between the lower frequency audio components and reduce the negative feedback level of higher frequency audio components to increase their amplification...”

Col. 5 line 37: “... The reactive network thus acts as a variable low pass filter to alter the phase of the lower frequency components most subject to phase shift distortion, while emphasizing the higher frequencies that are relatively immune to phase shift distortion...”

The description is of a particular circuit design for reducing low frequencies and increasing high frequencies. There is no mention made of any comparison, or any reference to compare to. The version in the abstract includes the phrase “...to make the speech sounds reproduced more intelligible...”, but this does not constitute an attempt at fidelity (i.e., to sound more like the actual voice of the user).

From Davis, Col.6, lines 7-20:

“With the preferred embodiment using circuit components specified herein, the entire unit, including its power supply batteries, weighs less than one pound, and the amplifier and loudspeaker unit with its protective case is only about five and a half inches long, three and a half inches wide and one inch thick. Accordingly, through use of the improved throat

microphone combined with the relatively simple phase shift compensation network within the amplification circuitry, the system in accordance with this invention is able to provide a significantly better quality of voice communication than available heretofore between individuals in emergency and industrial situations requiring the use of breathing masks.”

Davis does not teach or suggest comparing a result to an original reference source. Under the circumstances of Davis, this is not desirable. Davis states his intent with the description, “...to provide a significantly better quality of voice communication than available heretofore between individuals in emergency and industrial situations requiring the use of breathing masks.” This effort at increased intelligibility makes no attempt to either compare to a reference, establish a reference, or create any kind of quality hi-fidelity result, and is not adaptable to either the goals or the teachings of the presently claimed invention.

Intelligibility is not considered to be related to an accurate frequency reproduction. “The Handbook for Sound Engineers”, Glen Ballou, ed., 2nd Edition, Howard Sams and Co. , page 330, section 13.1.10 defines the frequency range of telephone transmission between 300 and 3500Hz, as do many other references. A current standard textbook (“An Introduction to the Psychology of Hearing”, Brian C.J. Moore, 1997, Academic Press (San Diego, CA), Page 302) states “...[e]xperiments using bandpass filters have shown that, over a fairly wide range of centre frequencies, a surprisingly narrow band of frequencies is sufficient for satisfactory recognition. For example, a band of frequencies from 1000 Hz to 2000 Hz is sufficient to give a sentence articulation score of about 90%...”. The Moore text also states that there are a variety of limited frequency bands that can give good intelligibility.

Davis seeks to increase intelligibility of a person talking inside of an “...airtight tympanic enclosure...” (mask). He reduces a frequency band that has problems because of resonances

caused by the mask (“...a low pass filter...corrects the phase shift of the different lower frequency audio signal components..”), and emphasizes a frequency band appropriate for intelligibility that is muffled by the mask (“...emphasizing the higher frequency components...”)
[quotes from Abstract of Davis]. These accommodations are made regardless of who is speaking inside the mask. Davis provides no elements for, or ever refers to, accommodating the sound of any given person’s vocal qualities.

Summary

While Kehoe and Davis disclose the human voice as an acoustical generator, and disclose modifying the acoustic signal, the references disclose systems and methods that are different from those presently claimed. In order to justify a rejection of the claims under 35 U.S.C. § 103(a), there must be some suggestion in the references or prior art to modify them to achieve the presently claimed invention. (See MPEP § 2143). The differences between the references and the claimed inventions are not trivial, in part because they are drawn to completely different issues, and in particular because they disclose no reference signal, no comparison step, and no design based on a comparison step.

In both of the cited references, the goal is a modification of an original acoustical signal that produces a result PURPOSELY DIFFERENT from the original. Kehoe seeks to affect the acoustical generator to alter his/her acoustical signal to imitate an imagined emotional state, and Davis seeks to modify the acoustical signal as perceived in a specific environment (inside a breathing mask) in a way that emphasizes particular characteristics of the sound (the frequency ranges associated with human vocal intelligibility).

The present invention concerns a different issue – how to convert a measurement of an acoustically generated signal that is measured at an acoustically disadvantaged position into a signal that is significantly more like the same acoustically generated signal from an acoustically ideal position. In order to do this, one must first establish a reference. In one embodiment, the tailor-made equalizer eliminates the need for true technical expertise, a lot of time and experimenting, or both. A feasible and specified location for a transducer is combined with a processing device that is specifically constructed to accomplish this. In an embodiment for a designated acoustical generator type (e.g., a guitar, or a violin, or a snare drum), which is preferred for economical manufacturing and distribution, the device contains a minimum number of controls; each control is designed such that it provides an easily hearable distinct proper setting for any one of a variety of instances of the designated acoustical generator type; and does so in a manner that precludes the need for any technical expertise or time consuming experimentation. Essentially, the experimenting and expertise are done using the method, and the results are then built into an embodiment.

In view of the above, reconsideration and withdrawal of the rejection of claims 1-5 and 13-15 under 35 U.S.C. § 103(a) is respectfully requested .

CONCLUSION

For all the above reasons, the Applicant respectfully submits that this application is in condition for allowance. A Notice of Allowance is earnestly solicited.

The Examiner is invited to contact the undersigned at (202) 220-4200 to discuss any matter concerning this application. The Office is hereby authorized to charge any additional fees or credit any overpayments under 37 C.F.R. § 1.16 or § 1.17 to Deposit Account No. 11-0600.

Respectfully submitted,
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